

Müller, Holger, Schmale, Udo

Patent Claims

1. Method for the quantitative gas analysis in which the gas analysis of a sample atmosphere is implemented by means of a sensor device, a diffusion seal being produced between the sample atmosphere contained in a sample system and a measuring chamber (9) via a measuring adapter (4), at least one radiation source (16) and at least one detector device (17) being orientated on the measuring chamber (9) in such a manner that the measuring radiation emitted from at least one radiation source (16) proceeds at least once through the measuring chamber (9) and is detected by at least one detector device (17) after leaving the measuring chamber (9), characterised in that a sensor head (5) is used which can be coupled to the measuring adapter (4) and in which at least one radiation source (16) and/or at least one detector device (17) are disposed.
2. Method according to claim 1,
characterised in that the measuring adapter (4) is heated.
3. Method according to claim 1 or 2,
characterised in that the measuring adapter (4) is used only once in order to avoid cross-contaminations.
4. Device for the quantitative gas analysis of a sample atmosphere, which is contained in a sample system, with a measuring adapter (4), which contains a measuring chamber (9), a diffusion pipe, a cannula or at least one opening in the measuring chamber wall as diffusion seal for the diffusion of the sample atmosphere into the measuring chamber, a radiation source (16) and a detector device (17), the measuring chamber (9) being delimited by at least one

SEARCHED - SERIALIZED - INDEXED - FILED

cover (15), which is permeable for a measuring radiation (24) of the radiation source (16), and the radiation source (16) and the detector device (17) being disposed on the measuring chamber (9) in such a manner that the measuring radiation (24) emitted from the radiation source (16) is detected by the detector device (17) after passing at least once through the measuring chamber (9), characterised in that the radiation source (16) and/or the detector device (17) are disposed in a sensor head (5) which can be coupled to the measuring adapter (4).

5. Device according to claim 4,
characterised in that the measuring chamber (9) is contained in the
measuring adapter (4).
 6. Device according to one of the claims 4 or 5,
characterised in that the radiation source (16) is contained in the
measuring adapter (4).
 7. Device according to one of the claims 4 to 6,
characterised in that the measuring adapter (4) is configured as a
stopper.
 8. Device according to one of the claims 4 to 6,
characterised in that the measuring adapter (4) has a flanged
connection.
 9. Device according to one of the claims 4 to 6,
characterised in that the measuring adapter (4) has a screw thread.
 10. Device according to one of the claims 4 to 6,
characterised in that the measuring adapter (4) has a snap-on
device.

JOURNAL OF THE AMERICAN
OPTICAL INSTITUTE

11. Device according to one of the claims 4 to 10,
characterised in that the measuring adapter (4) contains a diffusion
pipe (20) as diffusion seal.
12. Device according to one of the claims 4 to 10,
characterised in that the measuring adapter (4) contains a cannula
(20) as diffusion seal.
13. Device according to one of the claims 4 to 10,
characterised in that the measuring adapter (4) contains at least
one opening (20, 33) as diffusion seal.
14. Device according to one of the claims 4 to 13,
characterised in that the measuring chamber (9) is delimited on one
side by the cover (15) and on the other side by a measuring
chamber wall (22, 29), which reflects the measuring radiation (24),
so that the measuring radiation (24) emitted from the radiation
source (16) is reflected towards the detector device (17) after passing
through the measuring chamber (9).
15. Device according to claim 14,
characterised in that the reflecting measuring chamber wall (22, 29)
has at least one opening (20, 33) as diffusion seal for the diffusion of
the sample atmosphere out of the sample system into the
measuring chamber.
16. Device according to claim 14 or 15,
characterised in that the measuring chamber (9) opens towards the
coupled-on sensor head (5) in a funnel- or pyramid-shape in order
to reflect the measuring radiation (24) on the measuring chamber
walls (22).
17. Device according to claim 14 or 15,

100332-001202

characterised in that the reflecting measuring chamber wall (29) is a reflection plate (29), which is parallel to the cover (15) and has openings (33) as diffusion seal.

18. Device according to one of the claims 4 to 17,
characterised in that the measuring chamber (9) has the first cover (15) between radiation source (16) and measuring chamber (9) and the second cover (15) between measuring chamber (9) and detector device (17).
 19. Device according to claim 18,
characterised in that the first cover (15) and the second cover (15) are disposed on the measuring chamber (9) situated approximately opposite each other.
 20. Device according to one of the claims 4 to 19,
characterised in that the measuring chamber (9) is disposed between the radiation source (16) and the detector device (17).
 21. Device according to one of the claims 4 to 20,
characterised in that the device has optical elements such as mirrors or light guides for introducing the measuring radiation (24) into the measuring chamber (9).
 22. Device according to one of the claims 4 to 21,
characterised in that the device has optical elements such as mirrors or light guides for directing the measuring radiation (24), which emanates from the measuring chamber, onto the detector device (17).
 23. Device according to one of the claims 4 to 22,
characterised in that the sensor device (13) has at least two radiation sources (16).

10 DECEMBER 2002

24. Device according to one of the claims 4 to 23,
characterised in that the sensor device (13) has at least two detector
devices (17).
25. Device according to one of the claims 4 to 24,
characterised in that a coupling device (14, 23, 32) is provided for a
coupling of the sensor head (5) to the measuring adapter (4).
26. Device according to claim 25,
characterised in that the sensor head (5) has a coupling device (14,
23).
27. Device according to one of the claims 4 to 26,
characterised in that a broad-band thermal radiator, LEDs (light-emitting
diodes), diode lasers, infrared radiators or UV light
radiators are provided as radiation source (16).
28. Device according to one of the claims 4 to 27, characterised in that
the radiation-permeable cover (15) is formed from lime-soda-glass,
boron silicate glass, quartz glass, silicon or sapphire, calcium
fluoride (CaF_2), barium fluoride (BaF_2), germanium (Ge) or zinc
selenide (ZnSe).
29. Measuring system comprising a device according to at least one of
the claims 4 to 6, 12 to 14, 16 and 18 to 28 and a sample system (2)
which contains a sample atmosphere,
characterised in that the measuring adapter (4) has a universal joint
for different sample systems (2).
30. Measuring system according to claim 29,
characterised in that the measuring adapter (4) can be coupled to a
pipe as sample system.

10007412-02000000

31. Measuring system according to claim 29,
characterised in that the measuring adapter (4) can be coupled to a
sample bottle (2) as sample system.
32. Measuring system according to claim 31,
characterised in that the measuring adapter (4) is formed as a
stopper for a sample bottle (2) which is present as sample system
and which stopper can be inserted in particular into a bottle neck
(21) of the sample bottle (2).
33. Measuring system according to one of the claims 29 to 31,
characterised in that the measuring adapter (4) has a flanged
connection.
34. Measuring system according to one of the claims 29 to 31,
characterised in that the measuring adapter (4) has a screw thread.
35. Measuring system according to one of the claims 29 to 31,
characterised in that the measuring adapter (4) has a snap-on
device.
36. Measuring system according to one of the claims 29 to 35,
characterised in that the measuring adapter (4) contains a diffusion
pipe (20) as diffusion seal.
37. Measuring system according to one of the claims 29 to 35,
characterised in that the measuring adapter (4) contains at least
one opening (20, 33) as diffusion seal.
38. Measuring system according to one of the claims 29 to 35,
characterised in that the measuring adapter (4) contains a cannula
(20) as diffusion seal.

400884-22-0000
2007-02-06

39. Measuring system according to claim 38,
characterised in that the sample system (2) is sealed with an
elastomer seal (10) and the measuring adapter (4) contains a
cannula (20) for penetrating the seal (10) as diffusion seal.

100364-28-024502